Software Product Description

PRODUCT NAME: DECnet-11M, Version 4.0
RSX-11M Network Software

SPD 10.75.11

DESCRIPTION:

DECnet-11M allows a suitably configured RSX-11M system to participate as a routing or non-routing (end) node in DECnet computer networks. DECnet-11M is a Phase IV network product and is warranted for use only with supported Phase III and Phase IV products supplied by DIGITAL.

DECnet Phase IV networks can contain up to 1023 nodes given proper network planning. Phase III nodes participating in Phase III/IV networks are limited to the Phase III routing capability of 255 nodes. Phase II nodes are not supported.

DECnet-11M offers task-to-task communications, utilities for network file operations, homogeneous network command terminal support, and network resource-sharing capabilities using the DIGITAL Network Architecture (DNA) protocols. DECnet-11M communicates with adjacent nodes over synchronous and asynchronous communication lines, Ethernet Local Area Networks (LANs) and parallel interfaces. Communications using X.25 circuits over selected Packet Switched Data Networks (PSDN) is also possible. This requires DECnet-11M to be configured with RSX-11 PSI/M product. Refer to the RSX-11 PSI/M SPD (10.42.xx) for further information. Access to DECnet-11M is supported for RSX-11M user programs written in MACRO-11, FORTRAN IV, FORTRAN-77, BASIC-PLUS-2, and COBOL.

The functions available to an RSX-11M user depend, in part, on the configuration of the rest of the network. Each DECnet product offers its own level of functionality and its own set of features to the user. Networks consisting entirely of DECnet-11M nodes can have the full functionality described in this SPD. Networks that mix DECnet-11M nodes with other DECnet products can limit the functions available to the DECnet-11M user because some DECnet-11M features are not supported by all DECnet products. Some supplied optional features require hardware configurations larger than the minimum supported systems.

The DECnet products and functions available to users on mixed networks can be determined by comparison of the SPDs for the component products.

Adaptive Routing

Adaptive routing is the mechanism by which one or more nodes in a network can route or forward messages between another pair of nodes in the same network. This routing capability will forward such messages even if no direct physical link exists between the pair of nodes apart from the sequence of physical links that includes the routing nodes.

A DECnet-11M node must function as a routing node whenever multiple lines are used simultaneously by that node. DECnet-11M end nodes provide all the capabilities of DECnet-11M routing nodes except that end nodes cannot route messages on behalf of other nodes in the network. Since end nodes do not route messages, they do not need to store or update routing databases. Consequently, end nodes use less system resource and generate less network traffic than routing nodes.

For this same reason, end node operation consumes less processing power than routing node operation. The Full Function DECnet-11M software must be installed on a node in order for that node to operate as a routing node. For a node to operate as an end node either the Full Function or the End Node DECnet-11M software must be installed on that node. Full Function DECnet-11M software allows a node to be set up as either a routing node or as an end node.

Although two adjacent routing nodes can be connected by more than a single physical link, messages will be sent over only one of the links. All other lines will serve as "hot standbys," such that the least cost path available between two nodes is the one that will be used for message traffic. A line cost parameter set by the system manager determines the line over which all messages will be sent from node to adjacent node.

Task-To-Task Communication

Using DECnet-11M, an RSX-11M user program written in MACRO-11 or one of the supported high level languages can exchange messages with other network user programs. These two programs can be on the same node or on any other Phase III or Phase IV node in the network. The messages sent and received by the two user programs can be in any data format.

The DECnet-11M software will optionally verify the access control privileges of a task requesting communication with a DECnet-11M task. The RSX-11M System Account File is used to determine access privileges. The results can either be passed on to the receiving task or used to reject the request by the network software.

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Network Resource Access

File Transfer Utilities

Using DECnet-11M utilities, a user can transfer sequential ASCII files between DECnet nodes. Files can be transferred in both directions between the locally supported RSX-11M File Control System (FCS) devices and the file system of other DECnet nodes. Wild cards can be used for the user identification code, file name, file type and version number for local to remote file transfers. Transfer of other file types is supported provided the source and destination DECnet systems support the same file type. Directory listings are also a supported DECnet-11M feature.

The DECnet-11M file transfer utilities support file transfers for both FCS and RMS files, where formats are compatible between the DECnet nodes.

Additional facilities allow system command files to be submitted to a remote node where the list of commands is in a format acceptable to the node responsible for the execution. DECnet-11M also allows RSX-11M command files to be received from other systems and executed.

A utility is also provided with DECnet-11M which allows the user to queue file operation requests for execution at a specified time. The user has the ability to monitor, list, and delete entries from this queue.

Network users must specify the appropriate user identification and password in order to access the files on a DECnet-11M node. Access to local files using the DECnet software can be controlled through the RSX-11M System Account File.

File Access

File access is supported to and from remote DECnet systems by explicit subroutine calls in the supported high level languages. READ, WRITE, OPEN and CLOSE, and DELETE operations can be initiated by local tasks for sequential and random access files residing on the local system or at remote DECnet systems. Other nodes supporting File Access can exercise this capability for files located on the RSX-11M node. Fixed and variable length record formats are supported. Files accessed remotely can contain either ASCII or binary information.

Access to RMS file organizations from other DECnet products is supported by DECnet-11M.

Network Command Terminal

DECnet-11M provides a utility that allows a terminal user to establish a virtual connection to another Phase IV DECnet-11M or DECnet-11M-PLUS system. This connection makes the terminal appear as if it were physically connected to the other system and the operator can use standard system and network utilities supported by that system. This utility is particularly useful for doing remote program development and allows terminal users on small application oriented systems to utilize the resources of larger development oriented systems.

DECnet-11M also provides an unsupported utility that allows a terminal user to establish a virtual connection to Phase III/IV DECnet-VAX systems. This utility is provided only as a courtesy from DIGITAL, with no implied support services offered, as is the case with other mentioned DECnet-11M-PLUS capabilities.

Down-Line System Loading

Initial memory images for DECnet-11S nodes in the network can be stored on RSX-11M file system devices and loaded into nodes across point-to-point, multipoint (DMP/DMV only) and Ethernet links. Load requests can come from the local RSX-11M operator or from the remote node. Generation of initial memory images of DECnet-11S systems for down-line loading is supported by RSX-11M.

Upline Dumping

Memory images of adjacent RSX-11S nodes connected by DECnet can be written onto a file on a DECnet-11M system. This facility helps a programmer understand what may have caused the RSX-11S system to crash.

Down-Line Task Loading

Programs to be executed on DECnet-11S nodes in the network can be stored on the DECnet-11M system and loaded on request into DECnet-11S nodes. In addition, programs already executing on DECnet-11S nodes can be checkpointed to the host file system and later restored to main memory of the DECnet-11S node. These features simplify the operation of network systems that do not have mass storage devices.

Network Management

The Network Control Program (NCP) performs three primary functions: displaying statistical and error information, controlling network components, and testing network operation. These functions can be performed locally or executed at remote Phase IV nodes that support this feature. In either case, the output resulting from a command can be directed to a local file or to the user's terminal.

An operator can display the status of DECnet activity at the local node and other Phase IV nodes. The user can choose to display statistics related to both node and communication lines, including data on traffic and errors. The local console operator can also perform many network control functions such as loading and unloading DECnet components, starting and stopping lines, activating the local node, and down-line loading DECnet-11S systems.

DECnet-11M also provides local network event logging to the console device, a remote node, or a user written program. The NCP utility can be used to enable and disable the logging of specific events as well as to enable and disable the event logging facility.

Communications

DECnet-11M, supports the DIGITAL Data Communications Messages Protocol (DDCMP) for full- or half-duplex transmission in point-to-point and multipoint operation using serial synchronous or asynchronous facilities. DDCMP provides error detection/correction and physical link management facilities. In addition, an auto-answer capability is provided.

Multipoint and auto-answer function with EIA-type devices only. Parallel communication devices use special link protocols (not DDCMP) optimized for their characteristics.

The DEUNA, when used in conjunction with the H4000 or DELNI transceiver, allows DECnet-11M to utilize Ethernet as a data link transmission medium.

RSX-11 PSI/M is the software product that provides an interface to X.25 Packet Switched Data Networks. When DECnet-11M is used in conjunction with RSX-11 PSI/M,

DECnet-11M can utilize the PSDN as though it was a standard datalink to transmit messages between DECnet nodes.

The maximum number of physical links that can be supported by a DECnet-11M node is sixteen depending on CPU memory, type of communications interface, and speed of interfaces.

A maximum of 32 X.25 virtual circuits is supported when DECnet-11M is used in conjunction with RSX-11 PSI/M for DECnet communication through an X.25 PSDN. However, when the total number of DECnet circuits (DLM and other) is greater than 24, the maximum node address supported is less than 1023 (#circuits • maximum address <25,000).

DECnet-11M multipcint will support up to a maximum of twelve tributaries on a single multipoint line. Aggregate bandwith of tributaries is limited to that of the control station device. The communication path to each tributary counts as a circuit with respect to the limits on number of circuits specified above. Multipoint line configurations are supported for the following devices:

Multipoint Devices

Devices	Multipoint Control Station (Master)	Multipoint Tributary (Slave)
DL11/DLV11	YES	YES
DUP11	YES	YES
DU11/DUV11	YES	YES
DPV11	YES	YES
DZ11/DZV11	YES	NO
KMC11 (DZ11)	YES	NO
KMC11 (DUP11)	YES	YES
DV11	YES	YES
DMP11*	YES	YES
DMV11*	YES	YES

*Multipoint communication hardware device

Direct Line Access

User written MACRO-11 tasks will be provided with Direct Line Access (DLX) support to all supported devices (including Ethernet Controller). DLX will allow direct control of the communications lines, bypassing the logical link control and transport mechanism provided by the DECnet software. User programs will be required on both ends of the link in order to use this interface.

Modification of the generation procedures is required to generate DLX-only nodes. This interface is useful in applications where the user desires to have minimum protocol overhead on a physical link and does not require the logical link management and other network services provided by the DECnet software for a particular line.

DECnet-11M Configuration

The process of configuring a DECnet-11M node is based primarily on trade-offs of cost, performance, and functionality, within the realm of satisfying the user's application requirements. It can be readily expected that network applications will run the full gamut from low-speed, low-cost situations to those of relatively high performance and functionality. The performance of a given DECnet node is a function not only of the expected network traffic and resultant processing ("global" conditions), but also of the amount of concurrent processing specific to that node (local conditions). Thus, node performance depends on many factors, including:

- CPU type and Memory Size
- Number of device interrupts per unit time
- Communication line characteristics
- Number and size of buffers
- Message size and frequency of transmission
- Local applications
- Size and frequency of route-through traffic

Note that the rate at which user data can be transmitted (throughput) over a communications line may sometimes approach, but will never equal or exceed, the actual line speed. The reason is that the actual throughput is a function of many factors, such as the network application(s), topology, protocol overhead and line quality, as well as the factors cited above.

NOTE: Careful analysis is required when configuring routing nodes with 124K words or less.

Five basic groups of communications interfaces are presented in the tables below. They differ in many respects, particularly in their effect upon CPU utilization.

- With character interrupt devices such as the DUP11, CPU cycles are required for not only the line protocal processing such as DDCMP or the optional X.25 protocol, but also for each character sent and received.
- Devices such as the DV11 are direct memory access (DMA) devices. Since DDCMP is in the PDP-11 software, CPU cycles are required for DDCMP line protocol processing.
- Devices such as the DMC11, DMR11, DMP11, DMU11, and KMS11 are direct memory access (DMA) devices. The line protocol is executed in microcode, thus offloading the PDP-11 CPU. The only DECnet load the processor sees is completed incoming and outgoing messages.
- The PCL11-B is a high speed DMA device which uses local parallel communications lines. It has its own line protocol and does not use DDCMP. CPU cycles are only required for processing of incoming and outgoing data messages and tc oerform control functions.
- The DEUNA, unibus to Ethernet controller, is a high speed DMA controller supporting CSMA/CD protocol CPU cycles are only required for processing of incoming and outgoing messages.

Device Groups

Device Group	Maximum Line Speed (Kilobits/sec)
Character Interrupt	
DL11/DLV11	9.6/4.8
DUP11/DPV11	9.6(1)/4.8
DU11/DUV11	9.6(1)/4.8
DZ11/DZV11	9.6
DMA	
DV11	9.6
KMC11 (DZ11)	9.6
KMC11 (DUP11)	19.2
KMS11-BD/E*	19.2
DMA/DDCMP	
DMC11-AR-DA	19.2
DMC11-AR-FA	56.0
DMC11-AL-MD	56.0
DMC11-AL-MA	1000.0
DMR11-AA	19.2
DMR11-AB,AC,AE	1000.0
DMP11-AA, DMV11-AA	19.2(2)
DMP11-AB, DMV11-AB,AC	56.0
DMP11-AE,AC	1000.0(3)
Parallel	
PCL11-B	4000.0
Ethernet	
DEUNA	10000.0

*Optional, requires the RSX PSI/M product

1 4.8K bps for 11/24 processor

2 Up to 56.0K bps for RS423-A interfaces

3 500K bps for full-duplex

These tables describe the physical hardware configurations supported by DECnet-11M in terms of CPU class and communication interface device group. It should be noted that the attachment of such devices as A/D converters and timesharing terminals can reduce the maximum number of communication lines which can effectively be supported. When used with RSX-11 PSI/M, the number of devices supported on any CPU will be dictated by the limits supported by the PSI product (see SPD 10.42.xx).

It is strongly recommended that DECnet-11M be configured as an end node if it is used on a Micro/PDP-11.

NOTE: In the following table, the rated bandwidth is stated for a single device type. The maximum bandwidth for an intermix of device types cannot be calculated from these tables

Maximum Line Configurations on 11/23 11/23-PLUS, MICRO/PDP-11 CPUs**

Device Group	Max. No. of Lines	Maximum Device Bandwidth (Kilobits/sec)	Mode
Character	8	14.4	FDX
Interrupt	8	28.8	HDX
DMV11*	2	112.0	FDX,HDX

*Not supported on 11/23

**Requires RL02 configuration for system and network generation

Maximum Line Configurations on 11/24,11/34,11/40,11/45,11/55,11/60 CPUs

Device Group	Max. No. of Lines	Maximum Device Bandwidth (Kilobits/sec)	Mode
Character	8	14.4	FDX
Interrupt	8	28.8	HDX
DMA	8	30.6	FDX
	8	61.2	HDX
DMA/DDCMP			
DMC11-AR-DA	16	307.2	FDX,HDX
DMC11-AR-FA	6	336.0	FDX,HDX
DMC11-AL-MD	6	N/A	FDX,HDX
DMC11-AL-MA	2	N/A	FDX,HDX
DMR11-AA	16	307.2	FDX,HDX
DMR11-AB-AC-AE	6*	336.0	FDX,HDX
PCL11-B	1	N/A	Parallel
DEUNA	2**	10000	Ethernet

*Two at 1M bps. One at 1M bps for 11/24

**Supported on 11/24, 11/34A only. Must be on independent Ethernet Networks

Maximum Line Configurations On 11/44 and 11/70 CPUs

Device Group	Max. No. of Lines	Maximum Device Bandwidth (Kilobits/sec)	Mode
Character	8	19.2	FDX
Interrupt	8	38.4	FDX
DMA	16	40.8	FDX
	16	81.6	HDX
DMA/DDCMP			
DMC11-AR-DA	16	307.2	FDX,HDX
DMC11-AR-FA	6	336.0	FDX,HDX
DMC11-AL-MD	6	N/A	FDX,HDX
DMC11-AL-MA	1	N/A	FDX,HDX
DMR11-AA	16	307.2	FDX,HDX
DMR11-AB-AC-AE	6*	336.0	FDX,HDX
PCL11-B	1	N/A	Parallel
DEUNA	2**	10000	Ethernet

*One at 1M bps for 11/44, 11/70

**Only one DEUNA on 11/70 CPU, must be independent Ethernet networks

Maximum Line Configurations Guidelines (Multipoint)

Maximum Line Speed (Kilobits per Second, half- or full-duplex)

Device Group	19.2	56	250	500	1000
DMV11-AA	2/8	2/8			
-AB	2/8	2/8			
-AC	2/8	2/8			
DMP11-AA	+4/8	2/8			
-AB	+4/8	2/8			
-AC	2/8	1/12	1/12	1/12*	
-AE	+4/8	2/8	1/12	1/12	1/12*

*half-duplex
+ 11/24 is limited to 2 controllers

NOTE: Left side of slash (/) indicates number of controllers per node and right side indicates total number of tributaries per control node.

Total number of circuits not to exceed 16 per node.

Number of tributaries on lines should be carefully configured for performance considerations.

In order to achieve a viable configuration, the user and/or a DIGITAL software specialist must perform a level of application analysis which addresses the factors above. In the preceding tables, the columns have the following meanings:

Maximum Number of Lines – The largest number of physical lines that can be attached and driven by the DECnet-11M system.

Maximum Device Bandwidth – The maximum total number of bits per second which can be handled by a CPU when all communication devices of a single given type, such as character interrupt, are added together. For example, DECnet-11M on a PDP-11/44 can accommodate two half-duplex character-interrupt devices at 19.2Kb, or eight at 4.8 Kb, or eight at 2.4 Kb (constrained by the maximum number of lines rather than bandwidth). Maximum device bandwidth should be calculated for all lines known to operate concurrently. Maximum bandwidth on a multipoint line is limited to that supported by the Control Station device.

Maximum Line Speed – The fastest clock rate at which the device can be driven under DECnet-11M. If specific devices have the ability to operate at a maximum rate, they must be configured subject to the "maximum device bandwidth" restriction above.

Mode – This indicates whether the line is operating in either half-duplex (a single bit stream) or full-duplex (two concurrent bit streams) mode. In some instances in the tables, a half-duplex line is quoted as having maximum bandwidth approximately double that of the comparable full-duplex line. This reflects the single bit stream character of half-duplex lines, and the fact that two of them place a load on the CPU roughly equivalent to one full-duplex line with traffic in both directions.

MINIMUM HARDWARE REQUIRED:

Any valid RSX-11M system configuration with:

- The following additional memory available.

  DECnet-11M end node – 16KW
  DECnet-11M routing node – 18KW
  DECnet-11M end node with RSX-11 PSI/M – 22KW
  DECnet-11M routing node with RSX-11 PSI/M – 30KW
  Ethernet support will add 3KW to the above memory requirements

- The following additional number of disk blocks available for DECnet-11M network software

  DECnet-11M end node – 4000
  DECnet-11M routing node – 4500
  DECnet-11M end node with RSX-11 PSI/M – 4500
  DECnet-11M routing node with RSX-11 PSI/M – 5000

- PDP 11/24, PDP11/44, or PDP11/70 central processor with one of the following communications devices:

  DUP11-DA low-speed synchronous interface (5)
  DU11-DA low-speed synchronous interface (4)
  DMC11-AR-DA remote synchronous V.24/EIA RS-232-C interface (4)
  DMC11-AR-FA remote synchronous V.35/DDS interface (4)
  DMC11-AL-MD high-speed local synchronous interface (4)
  DMC11-AL-MA high-speed local synchronous interface (4)
  DMP11-AA synchronous UNIBUS interface RS232-C/RS423-A (5)
  DMP11-AB synchronous UNIBUS interface CCITT V.35/DDS (5)
  DMP11-AC local synchronous UNIBUS interface (5)
  DMP11-AE synchronous UNIBUS interface RS422 (5)
  DMR11-AA synchronous UNIBUS interface RS232-C CCITT V.24 (5)
  DMR11-AB synchronous UNIBUS interface CCITT V.35/DDS (5)
  DMR11-AC local synchronous UNIBUS interface (5)
  DMR11-AE synchronous UNIBUS interface RS449/422 (5)
  DL11-E asynchronous EIA interface with modem control (5)
  DL11-C WA asynchronous 20mA current loop interface (1,5)
  DZ11-A,B multiline asynchronous EIA interface (2,5)
  DZ11-C,D multiline asynchronous 20mA current loop interface (1,2,5)
  DV -AA,BA multiline NPR synchronous interface (2,5)
  PCL11-B multiple CPU link
  DEUNA Unibus to Ethernet controller
  KMS11-BD E, synchronous UNIBUS multiplexer interface (3)

- PDP 11 23, 11 23 Plus or Micro PDP-11 central processor with one of the following communications devices (Micro PDP-11 Configuration must include RL02 for system and network generation)

  DMV11-AA synchronous QBus interface RS232-C RS423A (5)
  DMV11-AB synchronous QBus interface V 35 DDS for 11 23 PLUS (5)

DMV11-AC local synchronous QBus interface for 11/23 PLUS (5)
DUV11-DA low-speed EIA synchronous interface (5)
DLV11-E asynchronous EIA interface with modem control (5)
DLV11-F asynchronous 20 mA current loop interface (1,4)
DZV11-B multiline asynchronous EIA interface (2,5)
DPV11-DB synchronous QBUS interface (5)

NOTES:

(1) Requires either the H319 option for optical isolation or one side of the 20mA line to be in passive mode.
(2) All lines on this interface must be dedicated as DECnet links
(3) Requires RSX-11 PSI/M product.
(4) These products are no longer marketed by DIGITAL and may not be supported in future releases of DECnet-11M
(5) Or FCC eqivalent hardware option.

OPTIONAL HARDWARE:

- Additional lines and/or communication interfaces (as listed above) up to maximum as defined in Maximum Line Configurations tables for mapped systems.
- KG11-A Communications Arithmetic Element (may be used in conjunction with DV11, DZ11, and DL11)
- KMC11-A (without the RSX-11 PSI/M product, can be used in conjunction with up to eight DUP11s or with up to a sixteen line DZ11)

PREREQUISITE SOFTWARE:

RSX-11M Operating System

Refer to the RSX-11M Optional Software Cross Reference Table (SPD 20.98.xx) for the required version

OPTIONAL SOFTWARE:

COBOL 81
FORTRAN-77 RSX
PDP-11 BASIC-PLUS-2 for RSX-11M
RSX-11 PSI/M

SOFTWARE WARRANTY

Warranty for this software product is provided by DIGITAL with the purchase of a license for the product. There is no additional charge. This software product is warranted to conform to the Software Product Description (SPD). This means that DIGITAL will remedy any nonconformance when it is reported to DIGITAL by the customer during the warranty period.

The warranty period is ninety (90) days. It begins when the software is installed or thirty (30) days after delivery to the end user, whichever occurs first and expires ninety (90) days later or one hundred eighty (180) days after release of a subsequent version of the software

Warranty Service

DIGITAL provides software warranty service worldwide. Service is provided in the country of purchase and is not transferable between countries

DIGITAL will provide a service location which will accept reporting (in a format prescribed by DIGITAL) of a nonconformance problem caused when using the licensed software under normal conditions as defined by the SPD. DIGITAL will respond to a nonconformance problem in the current unaltered release of the licensed software by issuing correction information such as: correction documentation, corrected code, or notice of availability of corrected code; or a restriction or a bypass. The customer will be responsible for the preparation and submission of the problem report to the service location.

Warranty Exclusion

DIGITAL DOES NOT WARRANT THAT THE SOFTWARE LICENSED TO CUSTOMER SHALL BE ERROR FREE, THAT THE SOFTWARE SHALL OPERATE WITH ANY HARDWARE AND SOFTWARE OTHER THAN AS SPECIFIED IN THIS SPD, THAT THE SOFTWARE SHALL SATISFY CUSTOMER'S OWN SPECIFIC REQUIREMENTS, OR THAT COPIES OF THE SOFTWARE OTHER THAN THOSE PROVIDED OR AUTHORIZED BY DIGITAL SHALL CONFORM TO THE SPD

DIGITAL MAKES NO WARRANTIES WITH RESPECT TO THE FITNESS AND OPERABILITY OF MODIFICATIONS NOT MADE BY DIGITAL

IF THE SOFTWARE FAILS TO FUNCTION FOR REASONS STATED ABOVE, THE CUSTOMER'S WARRANTY WILL BE INVALIDATED AND ALL SERVICE CALLS WILL BE BILLABLE AT THE PREVAILING PER CALL RATES.

INSTALLATION

Only experienced customers should attempt installation of this product. DIGITAL recommends that all other customers purchase DIGITAL's Installation Services. These services provide for installation of the software product by an experienced DIGITAL Software Specialist

DIGITAL's Installation Services can be purchased as a separate service.

Installation Services

For a fixed price a DIGITAL Software Specialist will assure that
the customer's system is ready for installation, install the software, and familiarize the customer with its operation

Installation for DECnet-11M will consist of the following

- Verification that all components of DECnet-11M have been received.
- Verification that the necessary versions of the RSX-11M software and documentation are available
- Verification of the appropriate sysgen parameters

NOTE: Should a software specialist be required to modify the previously installed operation system parameters, a time and materials charge will apply

- Install DECnet-11M software
- Define and create a local node DECnet database
- Modify the system's start-up command procedure including starting up the DECnet-11M network
- Verify the proper installation of DECnet-11M by running a series of tests to show connectivity (demonstrated by the use of the post installation checkout procedure) to a designated node

Connectivity to all other nodes within the network is the responsibility of the customer

Pre-Installation Procedures Required

Before DIGITAL can install the software, the customer must:

- Ensure that system meets the minimum hardware and software requirements (as specified in the SPD.)
- Obtain, install and demonstrate as operational any modems and other equipment and facilities necessary to interface DIGITAL's communication equipment.
- For multi-node networks designate one adjacent node to verify installation/connectivity.
- Make available for a reasonable penod of time, as mutually agreed upon by DIGITAL and the customer, all hardware communication facilities and terminals that are to be used during installation.

Delays caused by any failure to meet these responsibilities will be charged at the prevailing rate for time and materials.

COURTESY INSTALLATION SERVICE This software product will be installed by DIGITAL at no additional charge if you purchase Installation Service for the host Operating System and you install both software products concurrently.

ORDERING INFORMATION

DIGITAL provides a wide range of material and service options supporting this software product. Each option is described below. **IF YOU ARE ALREADY FAMILIAR WITH THESE OPTIONS YOU MAY OBTAIN THE ORDERING INFORMATION DIRECTLY FROM THE SOFTWARE OPTIONS CHART.** In most cases you will want to review the following descriptions to determine what options you require.

You will need a separate license for each CPU on which you will be using the software product (except as otherwise specified by DIGITAL). Then you will select the materials and service options you need to utilize the product effectively.

You order the license, materials and services using order numbers of the form: Qxxxx-X?. "Qxxxx" refers to the specific software product, "X" is the license code or material service option and "?" is the selectable media code for machine readable materials.

Single-Use licensed software is furnished under the licensing provisions of DIGITAL's Standard Terms and Conditions of Sale, which provide in part that the software and any part thereof may be used on only the single CPU on which the software is first installed, and may be copied in whole or in part (with the proper inclusion of DIGITAL's copyright notice and any proprietary notices on the software) for use on such CPU

LICENSE OPTIONS

Single-Use License Option

The Single-Use License is your right to use the software product on a single CPU and it includes your 90 day warranty.

For your first installation of this software product you must purchase as a **minimum**:

- Single-Use License Option, and
- Distribution and Documentation Option

The license gives you the right to use the software on a single CPU and the Distribution and Documentation option provides the machine readable software and related documentation

To use this software product on additional CPU's, you must purchase as a **minimum**:

- Single-Use License Option

In addition to the right to use, the license gives you the right to copy the software from your original CPU installation to the additional CPU. Therefore, the Distribution and Documentation option is not required, but optional

MATERIALS AND SERVICE OPTIONS

Distribution and Documentation Option

The Distribution and Documentation option provides the software object code in binary form and the basic documentation. You must have, or order, a Single-Use License to obtain this option. You will need this option to install the software for the first time. You will also need this option to obtain revised versions of the software product when they become available

If you prefer to receive automatic distribution of revised versions for this product, you must purchase a Software Product Service Agreement

Software Revision Right-To-Copy Option

The Right-To-Copy option allows a customer with multiple CPU's to copy a revised version of a software product from one CPU to another. Each CPU must be licensed for that product. You first install the revised software on one CPU, then you can make copies for additional CPU's by purchasing the Right-To-Copy option for each additional CPU

If you prefer to automatically obtain the right-to-copy, you must purchase a Service Right-to-Copy for each additional CPU. this is a service added to a Software Product Service Agreement

Documentation-Only Option

You can obtain one copy of the basic documentation by purchasing the Documentation-Only option

Installation Service Option

Installation Service includes those services provided by a DIGITAL Software Specialist to successfully install a software product. Digital's Installation Service accelerates your productive use of this product. (If Operating System parameters must be changed, system regeneration may not be included in the Installation Service.)

Installation Service will be provided at no additional charge (Courtesy Installation) under the conditions described in the Installation section above

NETstart Services Options

NETstart Services help you start-up operation of your DECnet networking environment quickly by accelerating the learning process of your staff. It includes direct assistance, documentation review, discussion and hands-on experience provided on-site by a DIGITAL Networking Specialist. NETstart is designed to benefit first time users as well as experienced network computer users

There are two levels of NETstart Services. NETstart I is the most comprehensive start-up service, followed by NETstart II

You should be experienced with your appropriate operating systems prior to scheduling these services. Contact your DIGITAL representative for more details on NETstart Services.

Software Product Service Agreements

DIGITAL offers you a choice of three Software Product Service Agreements to support your software. These agreements provide a set of the following services depending on the agreement selected: remedial and maintenance service, revised versions of the software and documentation, telephone support and newsletters or dispatches containing suggested fixes for known problems.

The level of service you need depends primarily on three factors: (1) your available manpower, (2) your staff's level of expertise, and (3) the importance to you of having your system current and operating at peak efficiency. Our DIGITAL representative can help you select the service best suited to your needs. The agreement types are listed below.

DECsupport Service is designed for people requiring high availability of their system and for customers who need regular access to DIGITAL's technical expertise. It is the most comprehensive support service, offering on-site preventative maintenance and remedial support for critical problems. In addition, it also provides revised versions of the software and documentation, fast response, telephone support and newsletters or dispatches.

BASIC Service is ideal for customers who have their own technical staff but need fast answers to operational questions. The telephone support provided in this service gives you timely answers and solves most software problems. In addition, you get revised versions of the software and documentation, and newsletters or dispatches.

Self-Maintenance Service is designed for customers who require only minimal support but wish to receive revised versions of the software and documentation information from DIGITAL. In addition, the service provides newsletters or dispatches.

All agreements are available to licensed DIGITAL customers on an annual, contractual basis.

The Prerequisite Software, as specified by this SPD, must have the equivalent level Software Product Service.

A variety of service options may be added to an existing Software Product Service Agreement as follows:

- Customers who want to copy the revised software received under their Software Product Service Agreement onto additional CPUs running that same product may order a Service Right-to-Copy for each CPU, Qxxxx-3Z.
- Customers who have a Software Product Service Agreement can obtain an additional copy of the documentation supplied under the Agreement by ordering the Documentation Update Service, Qxxxx-KZ.
- Customers who have a Basic Service or DECsupport Service Agreement can add additional names to the three who, under the Agreement, may call the Telephone Support Center by ordering the Additional Telephone Support Center Contact Service, Qxxxx-6Z.

TRAINING FROM EDUCATIONAL SERVICES

To ensure customer success with DIGITAL products, Educational Services sells training for the installation, maintenance and/or management of DIGITAL software. Course formats vary from seminars to packaged training materials that include self-paced instruction and computer-based instruction to traditional lecture labs at DIGITAL's 27 worldwide Training Centers.

All course schedules, availability and purchasing information is listed in Educational Services' *DIGEST*, a quarterly publication designed to assist customers in planning their training programs.

Professional Software Services

DIGITAL Software Specialists are available on a per-call or resident contract basis to help in all phases of software development or implementation. Specialists are available to serve as technical consultants, decision support consultants or business systems analysts. Resources are available to:

- Supplement your programming staff
- Assume project management responsibility
- Develop software
- Assure successful start-up and performance with product specific packaged services

Contact your DIGITAL representative for additional information and ordering details.

SOFTWARE OPTIONS CHART

The distribution **Media Codes** used in the Software Options Chart are described below. You specify the desired Media Code at the end of the Order Number, e.g. QJ764-HD = binaries on 9-track 800 BPI Magtape (NRZI).

D = 9-track 800 BPI Magtape (NRZI)
H = RL02 Disk Cartridge
M = 9-track 1600 BPI Magtape (PE)
Q = RL01 Disk Cartridge
T = RK06 Disk Cartridge
V = RK07 Disk Cartridge
Z = No hardware dependency

NOTE: The availability of these software product options and services may vary by country. Customers should contact their local DIGITAL office for information on availability.

OPTIONS	**ORDER NUMBER**	**ORDER NUMBER**
LICENSE OPTIONS: A LICENSE IS REQUIRED FOR EACH CPU.	FULL FUNCTION	END NODE
Single-Use License	QJ764-UZ	QJ765-UZ
MATERIALS AND SERVICE OPTIONS:		
Distribution and Documentation Option	QJ764-HD QJ764-HH QJ764-HM QJ764-HQ QJ764-HT QJ764-HV	QJ765-HD QJ765-HH QJ765-HM QJ765-HQ QJ765-HT QJ765-HV
Software Revision Right-To-Copy Option	QJ764-HZ	QJ765-HZ
Documentation Only Option	QJ764-GZ	QJ765-GZ
Installation Service Option	QJ764-ID QJ764-IH QJ764-IM QJ764-IQ QJ764-IT QJ764-IV	QJ765-ID QJ765-IH QJ765-IM QJ765-IQ QJ765-IT QJ765-IV
SOFTWARE PRODUCT SERVICE AGREEMENTS:		
DECsupport Service	QJ764-9D QJ764-9H QJ764-9M QJ764-9Q QJ764-9T QJ764-9V	QJ765-9D QJ765-9H QJ765-9M QJ765-9Q QJ765-9T QJ765-9V
Basic Service	QJ764-8D QJ764-8H QJ764-8M QJ764-8Q QJ764-8T QJ764-8V	QJ765-8D QJ765-8H QJ765-8M QJ765-8Q QJ765-8T QJ765-8V
Self-Maintenance Service	QJ764-3D QJ764-3H QJ764-3M QJ764-3Q QJ764-3T QJ764-3V	QJ765-3D QJ765-3H QJ765-3M QJ765-3Q QJ765-3T QJ765-3V